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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,145	02/11/2005	Volker Hennige	264624US0XPCT	2408

22850 7590 03/05/2009

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EXAMINER	
BEST, ZACHARY P	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
03/05/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/524,145	HENNIGE ET AL.	
	Examiner	Art Unit	
	Zachary Best	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 December 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 24-34* is/are pending in the application.

4a) Of the above claim(s) *34* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,24-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

LITHIUM BATTERY SEPARATOR HAVING A SHUTDOWN FUNCTION

Examiner: Z. Best S.N. 10/524,145 Art Unit: 1795 February 24, 2009

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 15, 2008 has been entered.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Election/Restrictions

3. Newly submitted Claim 34 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: this application contains claims directed to the following patentably distinct species, Species A (Claims 1-10) and Species B (Claim 34). The species are independent or distinct because claims to the different species recite the mutually exclusive characteristics of such species. In addition, these species are not obvious variants of each other based on the current record. Species A requires that the porous carrier is bonded to a shutdown layer, which Species B does not

require. Species B requires a porosity ranging from 30-80%, which Species A does not require.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, Claim 34 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Specification

4. The objections to the specification are withdrawn because the title and abstract were amended.

Claim Objections

5. The objection to Claim 31 is withdrawn because Claim 31 was amended.

Claim Rejections - 35 USC § 112

6. The rejections under 35 U.S.C. 112, first paragraph are withdrawn because Claim 28 was amended and Applicant's arguments were persuasive with regards to Claim 27.

Claim Rejections - 35 USC § 103

8. Claims 1-8, 10, and 24-28, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (US 6,432,586 B1) in view of Hying et al. (WO 99/62620) and

Bauer et al. (US 6,632,561 B1). Subsequent references to Hying et al. are made based on corresponding US 6,620,320 B1.

Regarding Claim 1, Zhang teaches a lithium battery separator (abstract) having a shutdown function (col. 1, lines 51-53) comprising a carrier (26), comprising a porous composite layer (22, col. 3, lines 11-15) comprising inorganic, nonelectroconductive particles (col. 3, lines 46-59, see also col. 1, lines 27-31 and col. 2, lines 60-63), wherein the carrier (26) is bonded to a shutdown layer (24). However, Zhang does not teach the carrier has a porous inorganic, nonelectroconductive coating layer or the shutdown layer comprises meltable shutdown particles.

Hying et al. teach an ion-conducting composite that may be used in electrochemical apparatus (col. 1, lines 8-19) comprising a porous carrier having a porous inorganic nonelectroconductive coating on and in said carrier (Hying et al. claim 22). It is advantageous to coat the porous carrier with the ion-conducting composite because it improves relation to acids and has improved high temperature resistance (abstract and col. 1, lines 42-45).

Bauer et al. teach a lithium battery separator having a shutdown function, and comprising a porous carrier (col. 26, lines 25-50) wherein a shutdown layer of shutdown particles, which melt at a temperature and close the pores of said inorganic layer (col. 2, lines 25-49) present on said carrier and bonded thereto (col. 25, line 65 – col. 26, line 24) in order to improve dimensional stability at high temperature while maintaining excellent ion-conducting properties (col. 2, lines 25-30).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to create the lithium battery separator of Zhang with a porous inorganic nonelectroconductive coating on and in said carrier and a layer of shutdown particles because Hying et al. teach that coating the porous carrier with said coating improves relation to acids and high temperature resistance and Bauer et al. teach the shutdown particles improve dimensional stability at high temperature while maintaining excellent ion-conducting properties.

Regarding Claims 2 and 6, Zhang teach the carrier is 0.01-25 μm in thickness (col. 2, line 67 - col. 3, line 3), and Hying et al. teach the composite material, including the porous carrier, is bendable down to a radius as small as 1 mm (col. 5, lines 8-11).

Regarding Claims 3-5, Zhang teaches the carrier matrix is polymeric (col. 3, lines 30-46), Bauer et al. teach the carrier is polymeric and nonwoven and the material of said carrier is fibers of polyester or polyolefin (col. 26, lines 44-46), and Hying et al. teach the carrier is polymeric (col. 2, line 65 – col. 3, line 6).

Regarding Claim 7, Hying et al. teach the use of Alcoa CT3000SG alumina particles, which has a mean particle size of 0.7 μm as evidenced by Trübenbach et al. (US 5,935,897, Table 2).

Regarding Claim 8 and 31-32, Bauer et al. teach the particle size is 5 nm to 20 μm (col. 3, lines 57-67, and Hying et al. teach the coated carrier has a pore width of 1 nm to 5 μm (col. 9, lines 24-30).

Regarding Claim 10, Bauer et al. teach the shutdown particles are polymers or polymer blends (col. 2, lines 53-67).

Regarding Claim 24, Zhang teaches a process of preparing a battery comprising inserting the said separator into a battery cell (col. 2, lines 1-14).

Regarding Claim 25, Zhang teaches a battery comprising said separator and one or more additional components (col. 2, lines 1-14).

Regarding Claim 26, Zhang teaches the battery is a lithium battery (col. 2, lines 1-14).

Regarding Claim 27, Bauer et al. teach that the melting points of the particles are 120°C and above, but based on the usual operating temperature of the electrochemical cell (col. 3, lines 57-67). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust the melting point of the particles because Bauer et al. teach that the melting temperature of the particles should be adjusted based on the usual operating temperature of the electrochemical cell. Discovery of an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272 (CCPA 1980).

Regarding Claim 28, Hying et al. teaches the porous inorganic, nonelectroconductive coating layer is ceramic (col. 6, lines 40-44).

Regarding Claim 30, Bauer et al. teach the meltable shutdown particles contain at least one polyolefin (Bauer et al. claim 3).

9. Claims 9, 29, 32-33 are rejected are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang in view of Bauer et al. and Hying et al., as applied to Claims 1-8, 10, and 24-28, and 30-32 above, and further in view of Treger (US 5,091,272 A)

Regarding Claim 9, Zhang, Bauer et al. and Hying et al. teach the lithium battery separator as recited in Paragraph 8 above. However, Zhang, Bauer et al. and Hying et al. fail to specifically teach the layer of shutdown particles has a thickness, which is approximately in the range from said average size of said shutdown particles up to 10 times said average size.

Treger teaches a separator with a shutdown layer for use in electrochemical cells (abstract), wherein the layer of shutdown particles is approximately 4 times greater than the average particle size of said particles (col. 5, line 56 – col. 6, line 10). It is advantageous to have this thickness because the close packed structure has a high packing density and provides more rapid shut down of the layer (col. 3, lines 48-63). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to create the lithium battery separator of Zhang, Bauer et al. and Hying et al. wherein the thickness of the layer of shutdown particles is approximately 4 times greater than the average size of said shutdown particles because Treger teaches the structure will be closely packed and provide for a more rapid shut down of the separator.

Regarding Claim 29, Treger teaches the meltable particles may be natural waxes, synthetic waxes, or polymers, such as polyethylene (col. 3, lines 5-16). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made

to substitute a natural or synthetic wax for a polymer, such as polyethylene, as a meltable particle in the separator of Zhang, Bauer et al. and Hying et al. because Treger teaches functional equivalency of natural waxes, synthetic waxes, or polymers, such as polyethylene, as meltable particles in separators.

Regarding Claim 32, Treger teaches that the size of the meltable particles in relation to the pore size of the porous layer is directly related the permeability of the layer (col. 3, lines 48-63). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust the particle size of the meltable particles in relation to the pore size of the porous layer because Treger teaches the relation directly affects the permeability of the porous layer.

Regarding Claim 33, Treger teaches a layer of meltable particles having an average particle size of about 18 μm and the thickness of said layer was 1 mil (25.4 μm) (col. 7, lines 39-65 and col. 5, line 5 - col. 6, line 15).

Response to Arguments

10. Applicant's arguments filed December 15, 2008 have been fully considered but they are not persuasive or are moot in view of the new ground(s) of rejection.

Applicant argues:

(a) Hying et al. is improperly combined with the lithium battery art.

In response to Applicant's arguments:

(a) Hying et al. do not specifically teach an ion-conducting composite for fuel cells. Hying et al. teaches an invention that relates to an ion-conducting composite for use in a large variety of chemical and physical processes, including processes where electrochemical reactions occur (abstract and col. 1, lines 6-19). Zhang specifically points to the ionic conductive ceramic composite layer (col. 2, lines 52-67). Therefore, it is Examiner's position that one skilled in the art would look to modify Zhang with the teachings Hying et al. because both references refer to ion conducting inorganic materials.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zachary Best whose telephone number is (571) 270-3963. The examiner can normally be reached on Monday to Thursday, 7:30 - 5:00 (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571) 272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

zpb

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1795